

**Demonstrate Understanding of Bonding, Structure,
Properties & Energy Changes**

AS91164

You are advised to spend 60 minutes answering the questions in this section.

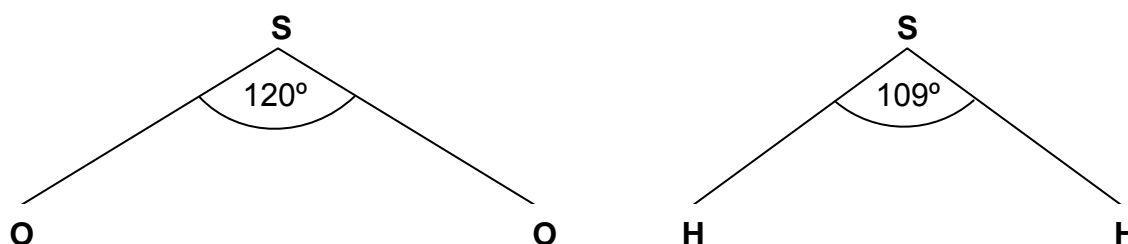
QUESTION ONE (Answer p 8)

(a) Complete the table below by:

- Drawing the Lewis structure (electron dot diagram) for each molecule
- Drawing a diagram to show the shape of each molecule
- Naming the shape of each molecule (A)

Molecule	Lewis Structure	Diagram of Shape	Name of Shape
PH ₃			
CO ₂			
H ₂ CO			

(b) The shapes of the two molecules SO₂ and H₂S are shown in the diagram below. The shape of both molecules is described as **bent**.



Explain why the bond angles in these two molecules are different. In your answer, you should make reference to the arrangement of electrons. (M)

(c) Molecules can be described as polar OR non-polar.

Circle the word that describes the **polarity** of each of the molecules CH₂Cl₂ and CHCl₃

CH₂Cl₂ Polar Non-polar

CHCl₃ Polar Non-polar

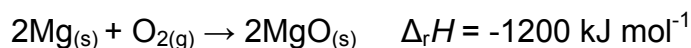
For each molecule, justify your choice.

QUESTION TWO (Answer p 9)

(a) Complete the table below by naming the type of solid and the type of particle found in each named substance in its solid state.

Solid	Type of Solid	Type of Particle
Mg (magnesium)		
O ₂ (oxygen)		
MgO (magnesium oxide)		

- (b) Magnesium burns in oxygen to produce magnesium oxide. The equation for the chemical reaction is represented by:



- (i) Calculate how much energy is released when 15.4 g of oxygen gas reacts. (A)
- (ii) Calculate the mass of magnesium that must react to release 98.2 kJ of energy. (MA)
- (c) The table below shows THREE physical properties of magnesium metal and magnesium oxide.

Magnesium metal is malleable. It can be easily shaped into thin sheets.

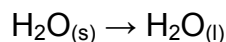
Magnesium metal does not dissolve in water.

Magnesium oxide does not conduct electricity as a solid but does conduct electricity when it is molten.

Justify EACH of the THREE properties of magnesium metal and magnesium oxide described above, using your knowledge of structure and bonding. (M/E)

QUESTION THREE (Answer p 10)

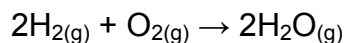
- (a) Ice melting to form water can be represented by the following equation:



Circle the term that best describes this reaction: **Exothermic** **Endothermic** (A)

Give reasons for your choice. (M)

- (b) The reaction between hydrogen gas and oxygen gas to form water in the gaseous state can be represented by:



- (i) When this reaction occurs, bonds are broken and bonds are formed. State which bonds are broken and which bonds are formed. (A)

- (ii) The bond breaking and bond forming processes above can be described as EITHER **exothermic** OR **endothermic**.

State which process is exothermic and which process is endothermic. (A)

Explain your answer. (E)

- (c) The melting points and solubilities in water of silicon dioxide and bromine are shown in the table below.

- (i) Complete the table below by identifying the bonding (attractive forces between particles) present in silicon dioxide and bromine.

	Melting Point °C	Solubility in Water	Bonding Between Particles
SiO ₂	1700	insoluble	
Br ₂	-7	soluble	

- (ii) Compare and contrast the melting point and solubility of these two substances using your knowledge of structure and bonding. (A/M/E)